DOCUMENT RESUME

ED 252 811 CS 007 821

AUTHOR Ruddell, Robert; Boyle, Owen
TITLE A Study of the Effects of Cognitive Mapping on Reading Comprehension and Written Protocols. Technical Report No. 7.
INSTITUTION Learning from Text Project, Riverside, CA.
PUB DATE Apr 84
NOTE 32p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cognitive Mapping; *Cognitive Processes; Cohesion (Written Composition); Higher Education; *Language Processing; *Reading Comprehension; Reading Processes; *Reading Research; Retention (Psychology); *Study Skills; *Writing (Composition); Writing Improvement
IDENTIFIERS Reader Text Relationship; Text Structure

ABSTRACT

A study explored how cognitive mapping assists college students in gathering information from long prose passages and organizing this information for subsequent writing. Mapping is a prewriting technique in which students develop a cognitive scheme or graphic representation of a text, which reduces memory load and facilitates integration and retention of information. It was hypothesized that mapping would help improve students' writing fluency and cohesion, as well as assist them in identifying main ideas and supporting details in articles. The 51 undergraduate subjects were tested prior to and after introduction to and practice with mapping techniques, to assess their ability to analyze and synthesize the six passages in the Organizational Patterns Test (OPT) and to write about them. The OPT contains three different organizational patterns: informational, thesis-proof, and problem-solution. In the pretest, students in all three treatment groups were given 10 minutes to prepare to write their essays. In the posttest, students in two of the treatment groups were given 10 minutes to map the OPT articles before writing essays, while those in the third treatment group prepared for the essays using an organizational preparation of their choice. The results indicated the subjects in the two mapping groups scored higher on the essays, used a greater number of cohesive ties, and wrote longer essays than did the nonmapping subjects. There was no difference between groups in ability to identify main ideas and supporting details. (HTH)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

X This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

ED252811

Technical Report No. 7

A Study of the Effects of Cognitive Mapping on Reading Comprehension and Written Protocols

Robert Ruddell and Owen Boyle

University of California, Berkeley

April, 1984

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Harry Singer

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CS 007 821

LEARNING FROM TEXT PROJECT

DIRECTOR
Harry Singer, School of Education
UC Riverside, CA 92521
714-787-3857 or 787-5228

ADVISORY COMMITTEE CO-CHAIRS
Deborah Hancock, Dean
School of Education
CSC Bakersfield

Harry Singer

ADVISORY COMMITTEE MEMBERS
Tom Bean

Alice Brekke, English
CSU Long Beach

Linda Jones
CSU Chancellor's Office

Charles Frazee, History
CSU Fullerton

Betty Levinson
Academic Resources Center
UC Los Angeles

Jane Stanbrough, UC Systemwide

Ovid Tzeng, Psychology
UC Riverside

ASSOCIATE DIRECTOR
Tom Bean, Reading Program
CSU Fullerton, CA 92634
714-733-3356

LIAISON WITH ADMINISTRATION
Alice Cox, UC Systemwide
Linda Jones, Chancellor's Office

CAMPUS COORDINATORS
Tom Bean, CSU Fullerton

Alan Crawford, CSU Los Angeles

Dan Donlan, UC Riverside

Deborah Hancock, CSU Bakersfield

James Flood & Diane Lapp,
CSU San Diego

John McNeil, UC Los Angeles

Robert Ruddell & Owen Boyle,
UC Berkeley

Julius Sassenrath, UC Davis

JOINT PROJECTS STEERING COMMITTEE CO-CHAIRPERSONS
Michael Hoffman, UC Davis
Linda Jones, CSU Chancellor's Office

PROJECT STAFF
Rosie Russell, Management Services Officer

RESEARCH ASSISTANTS
Greg Loomis, Ruth Yopp Nolte, Hallie Yopp

Learning From Text Publications

Conference Proceedings. (These are available from the ERIC Document Reproduction Service, 3900 Wheeler Ave., Alexandria, VA 22304. ERIC retrieval numbers are listed after each reference.)

1. Harry Singer and Thomas W. Bean (Eds.). Proceedings of the Lake Arrowhead Conference on Learning From Text, April 14-16, 1982. University of California, Riverside, Riverside, CAlifornia: Learning From Text Project, 1982. ERIC Retrieval No. ED 222 860.

2. Harry Singer and Thomas W. Bean (Eds.). Learning From Text Project: Conceptualization, Prediction and Intervention. Final Report, University of California, Riverside, CA: Learning From Text Project, 1982. ERIC Retrieval No. 223 989.

3. Harry Singer and Thomas W. Bean (Eds.). Lake Arrowhead Conference: Selection of Friendly Texts. University of California, Riverside, CA: Learning from Text Project, 1983 (in preparation).

4. Harry Singer and Thomas W. Bean (Eds.). Learning from Text: Explanation and Strategies. Preconvention Institute of the International Reading Association, Anaheim, California, May, 1983. University of California, Riverside: Learning from Text Project, 1983. ED 239 221.

Technical Reports

1. Harry Singer. A century of landmarks in reading and learning from text: Research, theories, and instructional strategies. Technical Report No. 1. University of California, Riverside: Learning from Text Project, 1982.

2. Thomas Bean, Harry Singer, Jack Sorter, and Charles Frazee. Acquisition of summarization rules as a basis for question-generation in learning from expository text at the high school level. Technical Report No. 2. University of California, Riverside: Learning From Text Project, 1982.

3. Harry Singer. Relationship between ability to learn from text and achievement in the UC and CSU systems: Executive summary. Technical Report No. 3. University of California, Riverside, CA: Learning From Text Project, 1983.

4. Thomas W. Bean and Harry Singer. Predicting freshman achievement in the UC and CSU systems. Technical Report No. 4. University of California, Riverside: Learning from Text Project, 1982.

5. Dan Donlan, Harry Singer, and Carlos Cortes. The effect of diagrammed paragraphs on the comprehension and recall of history text among university students: An exploratory study. Technical Report No. 5. University of California, Riverside, CA: Learning from Text Project, 1983.

6. Thomas W. Bean, Harry Singer, Jack Sorter, & Charles Frazee. Direct instruction in metacognitive strategies: Cumulative instruction in summarization and graphic organizer construction alone vs. an outlining strategy in 10th grade World History. Technical Report No. 6. University of California, Riverside: Learning from Text Project, 1983.

D73

A Study of the Effects of Cognitive Mapping on Reading Comprehension and Written Protocols

Robert B. Ruddell and Owen F. Boyle
University of California, Berkeley

Many college students are good readers who often have not learned the skills that will assist them in being successful, critical readers of college texts (Meyer, 1979; Brown, 1981; Tierney, 1982). The types of reading, analyzing, and synthesizing students are asked to do in college are both quantitatively and qualitatively different from what was asked of them in secondary schools. Although these students score high on standardized reading tests requiring them to read and interpret short passages, they have difficulty orchestrating information from the longer texts they are asked to read and write about in college.

A recent survey at UC Berkeley revealed that many students had just one technique for reading a chapter or section of a longer text; they read the chapter and underlined pertinent information, and if they did not understand everything, they read the chapter again and again so that at the end of their studying for a course many had underlined as if every sentence or idea in a chapter had equal importance (Ruddell & Boyle, 1981); as a result of their confusion about the nature of college reading, these students often wrote essays about their reading which lacked focus and cohesion.

Recently, researchers have addressed the ways readers interact with text (Rumelhart, 1979; Kintsch, 1980). Implicit to this work is a reading comprehension model which requires readers to relate and organize information in texts according to their prior knowledge about a subject. These researchers suggest the necessity for readers to organize, integrate, and chunk information into experimental and associational patterns in order to comprehend information in texts.

Various techniques have been developed to assist students in organizing and integrating information in texts and in reporting this information in writing. One of the most promising of these techniques is cognitive mapping (Hanf, 1971; Buckley-Hanf & Boyle, 1981). A map is a graphic representation of a text which reduces memory load and facilitates integration and retention of information. Mapping asks readers to develop a cognitive scheme which is a reconstruction of the words on the paper. A map is at once a scaffolding used by readers to graphicallly arrange ideas and becomes a blueprint for compositions. It assists short-term memory because it chunks ideas; and it causes readers and writers to look for significant ideas and relationships rather than to see each sentence or idea as equally important. Because mapping assists readers and writers in patterning and chunking information in texts, it assists them in remembering and comprehending texts, and provides a plan for reporting what has been learned.

Hypotheses

The purpose of this study was to discover if and how mapping assists undergraduate college readers in gathering information from

long prose passages and in organizing this information for writing. This study parallels the common ecological context of university courses by asking students to read long passages and asking them to write essays based upon these passages. Five hypotheses guide the study:

1. Students in treatment groups 1A and 1B[1] who develop cognitive maps based upon expository passages they have read will have significantly higher holistic scores on written protocols for each of three text patterns than students in treatment group 2 who do not map passages.

2. Students in treatment groups 1A and 1B who map will write essays with significantly more cohesive ties than students in treatment group 2 who do not create cognitive maps.

3. Students in treatment groups 1A and 1B who map will write longer essays than students in treatment group 2 who do not map.

4. Students in treatment groups 1A and 1B who develop cognitive maps will identify significantly more main ideas and supporting details in written protocols than students in treatment group 2 who do not map passages.

5. Different organizational patterns in the expository passages will significantly affect students' holistic writing scores regardless of treatment. The following order of difficulty is predicted for both the pre and posttests: Informational<Thesis-proof<Problem-solution.

Rationale

Mapping is a prewriting technique which assists writers in

generating, relating and shaping ideas. Students who develop maps for their essays should score higher on holistic evaluations of written protocols. The map gives writers a scaffolding for reconstructing and organizing ideas from text, and, because it assists memory, students can work with idea integration rather than on retrieving information. Thus, maps reduce cognitive demand on memory allowing students to concentrate on fluency and cohesion in their writing.

In addition to assisting students' writing, mapping should assist students in identifying main ideas and supporting details in articles. Cognitive mapping requires students to select basic ideas in a text, show their relationships, and become actively involved in reconstructing meaning from a text. As a result, it should assist readers in identifying text structure, main ideas, and supporting details.

Several recent studies have looked at student knowledge of text structure and comprehension of text (Bartlett, 1978; Brown, Campione, & Day, 1981). Based upon these studies, it would be expected that the three text structures in the Organizational Patterns Test, i.e., Informational, Thesis-proof, Problem-solution, administered to students in this study, will have an effect on student comprehension and composition. It is further expected that the informational pattern which presents propositions in a straightforward manner will be the easiest for students to understand and write about. In order to write an essay based upon the informational pattern, students need only to note the basic pieces of information and report them back

linearly in a written protocol. In the thesis-proof and problem-solution patterns, however, students must not only gather information but they must also integrate, synthesize and reorganize the information to reconstruct the author's intended meaning. Because these latter patterns require a conscious and systematic approach to reading and writing, students should have greater difficulty reading and reporting their learning based upon these patterns.

Methodology

Sample

The study was conducted at the University of California, Berkeley in the spring quarter of 1982. The 51 undergraduate students involved in the study volunteered to participate in a 'Learning from Text' course offered by the Graduate School of Education and the Student Learning Center. All 51 students volunteered to take different sections of the course based upon the hour that was convenient for them. The 17 Ss in treatment group 1A took the course as an adjunct to Sociology 1; the 17 Ss in treatment group 1B came from other courses across campus, but were not in Sociology 1; the 17 Ss in treatment group 2 took the 'Learning from Text' course as an adjunct to Sociology 1.

While random assignment was not used in assigning Ss to treatment groups, the nature of the self-selection, based on Ss schedules, provided for randomization. Support for this assumption can be found in examining the Ss STEP vocabulary and comprehension test scores. Mean raw scores on the STEP for the three groups were: Treatment

group 1A: 36; Treatment group 1B: 35; Treatment group 2: 36. These STEP raw scores are equivalent to a freshmen sample of one hundred and sixty-one students who attended UC Berkeley in the fall of 1982 and achieved a mean raw score of 35 (Ruddell & Boyle, 1982).

Treatment

All 51 Ss participating in the three sections of the 'Learning from Text' course were taught by the same instructor. The experimental intervention for treatment groups 1A and 1B consisted of three hours of instruction on mapping combined with the rest of the course which developed reading strategies including SQ3R and writing strategies emphasizing cohesion and revision. Treatment group 2, the control group, received the same intervention as treatment groups 1A and 1B except no mapping instruction was provided.

Although all three treatment groups in this study were taught by the same instructor, every effort was made to provide equal treatment for all three groups. The instructor kept a daily log to insure that the same skills were taught to each group with the exception of the mapping treatment.

The mapping process taught to Ss in this experiment was first developed for reading by Hanf (1971) and later developed for writing by Hanf-Buckley and Boyle (1981). The mapping process was introduced to Ss in the following way: first, students were told to generate as many words or phrases as possible on the topic, "The problems of being an undergraduate at UC Berkeley;" next, students were asked to organize their words into categories; finally, they were asked to

place their main idea in the center of a model map similar to Figure 1 and to place secondary and tertiary ideas in the appropriate extensions.

After an introduction to mapping, students typically go on to create more individualistic maps. Undergraduate students were found to develop sophisticated maps using interlocking triangles, concentric circles, and ladders to depict relationships which were used to help them structure their writing and shape it for special purposes and audiences. Mapping was used to provide a working outline---each category used to develop explanation, definition, classification, example, narration, comparison (Boyle, 1983). After a brief twenty minute introduction to mapping, students were told to map chapters they were reading using the first map as a prototype. The map in Figure 2 is a typical first effort by a freshman student based on section II of Jaggar & Rothenburg-Struhl's Feminist Frameworks: Alternative Accounts of the Relations between Women and Men (1978).

Instrument

Six expository passages operationally define the Organizational Patterns Test (OPT). All Ss were required to read the long prose passages presented in the OPT and to write about the main ideas and supporting details in these passages. The Fry Readability Scale was used to determine that the passages have similar reading levels; all passages were at the 11th or 12th grade level. The length of the passages were between 1300 and 1400 words.

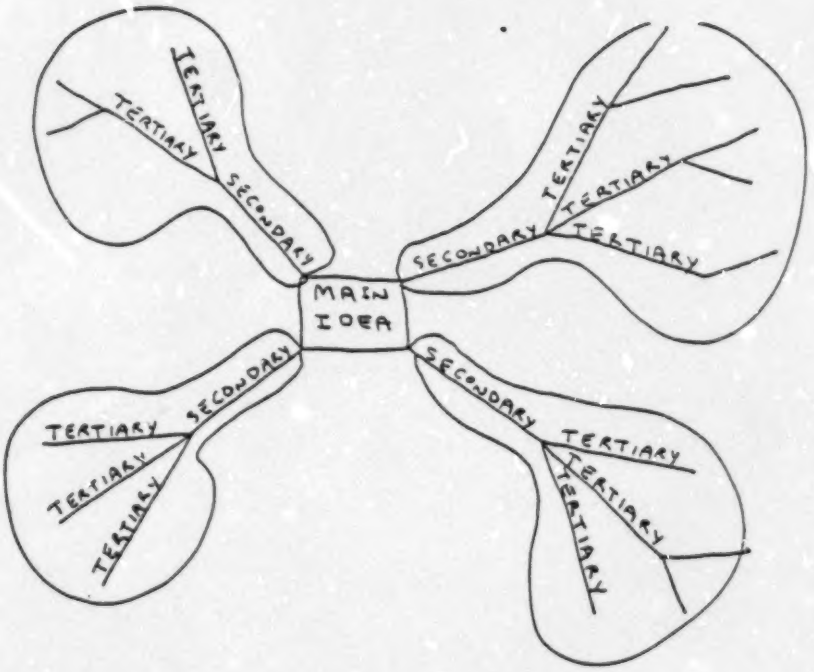

Fig. 1. Map used as a model in introducing cognitive mapping to students.

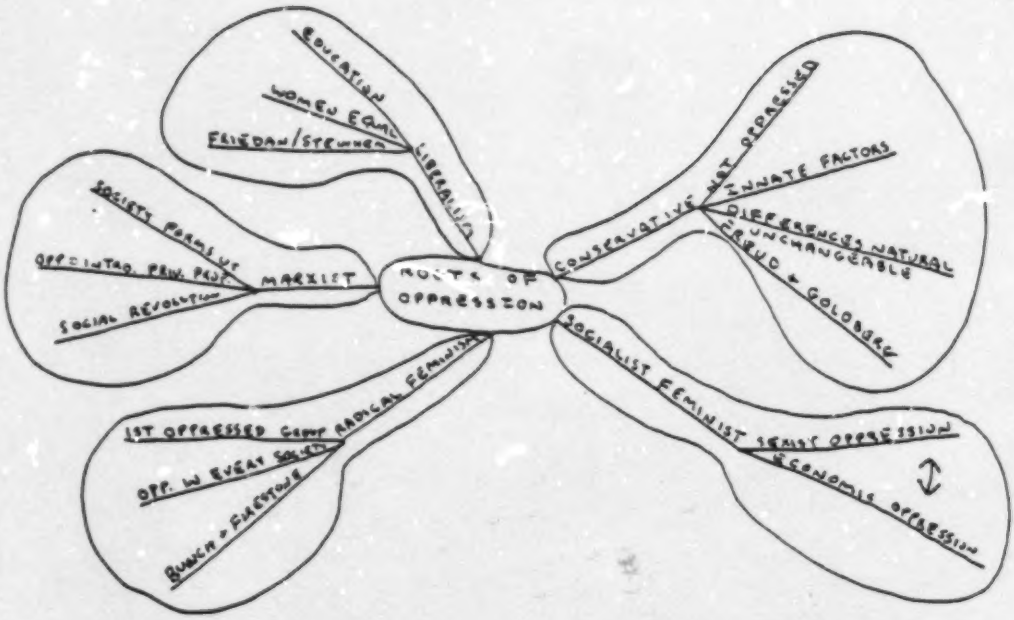

Fig. 2. Typical first map by freshmen student completed after twenty minute introduction.

BEST COPY AVAILABLE

The OPT contains two forms, each containing three different organiational patterns (1) informational, (2) thesis-proof, and, (3) problem-solution (Sach & Yourman, 1973). The patterns are defined in the following ways:

1. Informational pattern: The informational pattern begins with a thesis sentence or topic sentence which is followed by supporting details presented in a list-like manner. The article in form one was about the common causes of headaches and the article in form two was about M.B.A.'s on college campuses.

2. The thesis-proof pattern: The thesis-proof pattern presents information about a main idea or thesis, gives readers background information, proves a point of view, and suggests the implications of the essay. The article in form one was concerned with the prison system in the United States and the article in form two was about traffic courts.

3. Problem-solution pattern: The problem-solution pattern presents a problem, suggests the effects and causes of the problem, and proposes a resolution of the situation. The article in form one was about DNA research and the article in form two was about antihistamines.

Procedure for Administering the OPT

Ss were tested in pre and post conditions to assess their ability to analyze and synthesize the passages in the OPT and to write about what they had read. Two class periods before the test, Ss were taught techniques which would assist them in writing from given information

in textbooks. They also wrote on articles similar to the OPT passages.

Two forms of the OPT were given to the Ss. Half of the students in each group were administered form one as a pretest and form two as a posttest. The administration procedure was reversed for the remaining students.

Upon receiving the OPT, students were asked to write essays discussing the main ideas in each article and supporting details for these ideas. In the pretest, students in all treatment groups were given ten minutes to prepare to write their essays. In the posttest, students in treatment groups 1A and 1B were given ten minues to map the OPT articles before writing essays while treatment group 2 had ten minutes to prepare for the essays using an organizational preparation of their choice. All groups had the original articles for reference when they wrote their essays and had twenty minutes to write their essays.

Data Analysis

The first hypothesis stated that Ss in treatments 1A and 1B who developed maps of the reading passages would have significantly higher holistic scores on written protocols than Ss in treatment 2 who did not map articles. Holistic scores, derived from pre and posttest essays were used to address this hypothesis. The procedure for holistic scoring was first developed by Educational Testing Service twenty-five years ago. The procedure first separates the OPT essays into form one and form two and the type of organizational patterns in

the forms. Next, a few papers are read quickly by research assistants and rated on a scale of one through six, with a score of one representing the lowest score and a score of six representing the highest score. These papers were used as anchors or model papers for reading the remaining papers, following the ETS procedure. The papers, finally, were read and scored by twenty-five teachers who were attending the UC Berkeley Summer Teacher's Program of the Bay Area Writing Project; pre and posttest essays were read together. The papers were read by two readers and given a score of one through six. If the two readers were two or more rating points apart, a third reader scored the essay and this was used to establish the final rating. An analysis of variance was used to determine whether treatment groups made significant gains from pre to posttest holistic scores.

The second hypothesis stated that Ss in treatment groups 1A and 1B who developed maps of the OPT passages would write essays with more cohesive ties than Ss in treatment 2 who did not map the passages. A trait analysis was performed on each student essay to determine and evaluate the kinds of writing students provided for the OPT. Cohesion was evaluated according to the number of various conjunctions students used in the essays. Four kinds of conjunctive links were counted (Halliday & Hasan, 1971; Kintsch & van Dijk, 1978): (1) causal, e.g., because, due to, since; (2) additive, e.g., also, in addition, first, second, third; (3) contrastive, e.g., however, on the other hand; (4) conclusive, e.g., in summary, thus, therefore. An analysis of variance was used to test for significance.

The third hypothesis predicted that Ss in treatments 1A and 1B who mapped in preparation for essays would write longer essays than Ss in treatment 2 who did not map. The number of words in each posttest essay was counted to obtain a mean score for Ss in treatment groups 1A and 1B and for Ss in treatment group 2. An analysis of variance was used to determine significance.

The fourth hypothesis stated that Ss in treatment groups 1A and 1B who developed maps of OPT passages would identify main ideas and supporting details more often than treatment 2 Ss who did not develop maps. The main ideas and supporting details in the OPT passages were used as the criteria to evaluate the main ideas and supporting details presented in students' essays. An analysis of variance was used to determine significance.

The fifth hypothesis stated that different organizational patterns would affect Ss' abilities in all treatment groups to read and write about what they were reading. It was predicted that the order of difficulty would be the folowing: Informational<Thesis-Proof<Problem-Solution. Both holistic scores of student essays and the trait analysis were used to test for significance.

Findings and Discussion

The first hypothesis predicted that Ss in treatment groups 1A and 1B who developed maps for their essays would score significantly higher on holistic scores on each of the three text patterns than Ss in group 2 who did not create maps for their essays. Figure 3

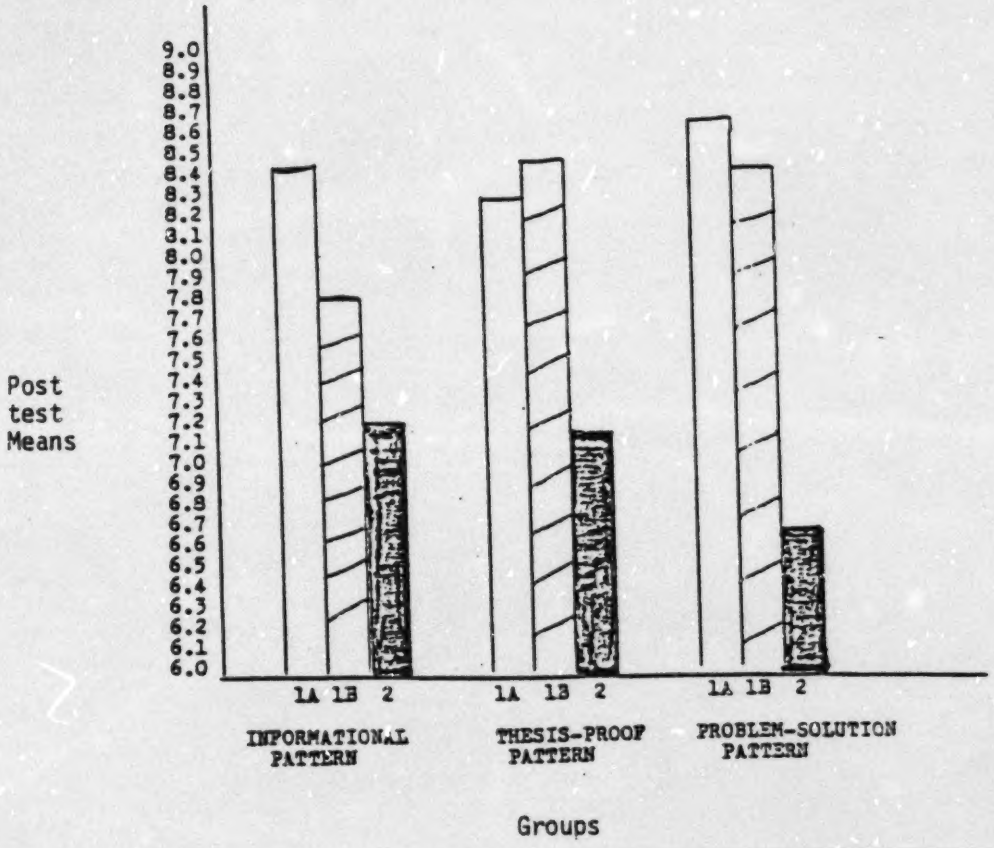

Fig. 3. Post test means for each treatment group on the Organizational Patterns Test, based on holistic scores.

illustrates the mean scores for each group on each of the three patterns. Treatment groups 1A and 1B, the mapping groups, scored higher on all three posttest essays than group 2, the nonmapping group. Moreover, when pre and posttest scores are compared, the analysis of variance indicates that the difference in gain scores on the thesis-proof and problem-solution patterns is significant, as shown in Table 1.

In addition to scoring higher on all three organizational patterns, Ss in treatment groups 1A and 1B show a greater rate of growth for each pattern than Ss in group 2, as depicted in Figure 4.

The second hypothesis stated that students in treatment groups 1A and 1B who mapped for their essays would write essays with more cohesive ties than students in group 2 who did not map. An analysis of cohesive ties (Kintsch & van Dijk, 1978) was used to compare and contrast the essays of mapping and nonmapping students. The following types of cohesive ties were identified in the essays: (1) causal, (2) additive, (3) contrastive, (4) conclusive. Figure 5 illustrates the total number of conjunctions or cohesive ties for each treatment group on all essays. Overall, the mapping Ss in treatment groups 1A and 1B used an average of four conjunctions for every one hundred words in the essays. In contrast, nonmapping Ss averaged two conjunctions for every hundred words. When essays were examined to discover if students were more likely to use certain types of conjunctions in response to specific organizational patterns, the results were negative. Students in all treatment groups used the same types of conjunctions in response to each of the organizational patterns. The

Table 1

Analysis of variance for each of the three essays based on the three patterns in the Organizational Patterns Test. Analysis based on a comparison of pre and post test holistic gain scores for each of the treatment groups.

INFORMATIONAL PATTERN

	Sum of Squares	DF	Mean Square	F-Value
Between Groups	SS_b = 5.30	2	MS_b = 2.65	
Within Groups	SS_w = 73.37	46	MS_w = 1.59	1.66
Total	SS_t = 78.67	48		

THESIS-PROOF PATTERN

	Sum of Squares	DF	Mean Square	F-Value
Between Groups	SS_b = 38.57	2	MS_b = 19.28	
Within Groups	SS_w = 53.37	46	MS_w = 1.16	16.62*
Total	SS_t = 91.94	48		

PROBLEM-SOLUTION PATTERN

	Sum of Squares	DF	Mean Square	F-Value
Between Groups	SS_b = 42.8	2	MS_b = 21.4	
Within Groups	SS_w = 62.45	46	MS_w = 1.35	15.85*
Total	SS_t = 105.25	48		

*Significant at .001 level.

BEST COPY AVAILABLE

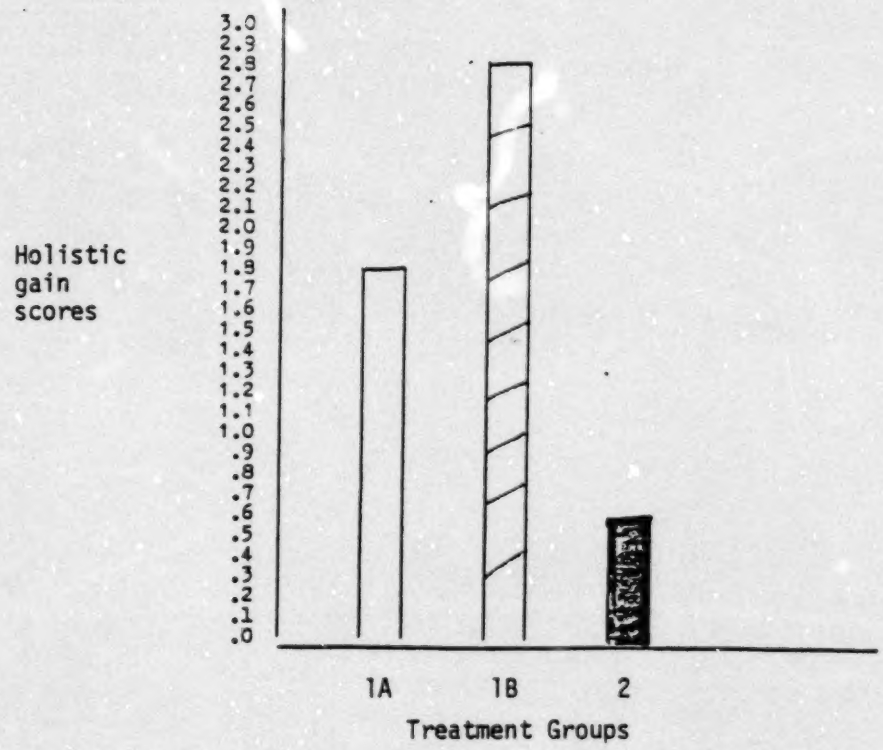

Fig. 4. Total holistic gain scores for students in each treatment group. Scores based on the Organizational Patterns Test.

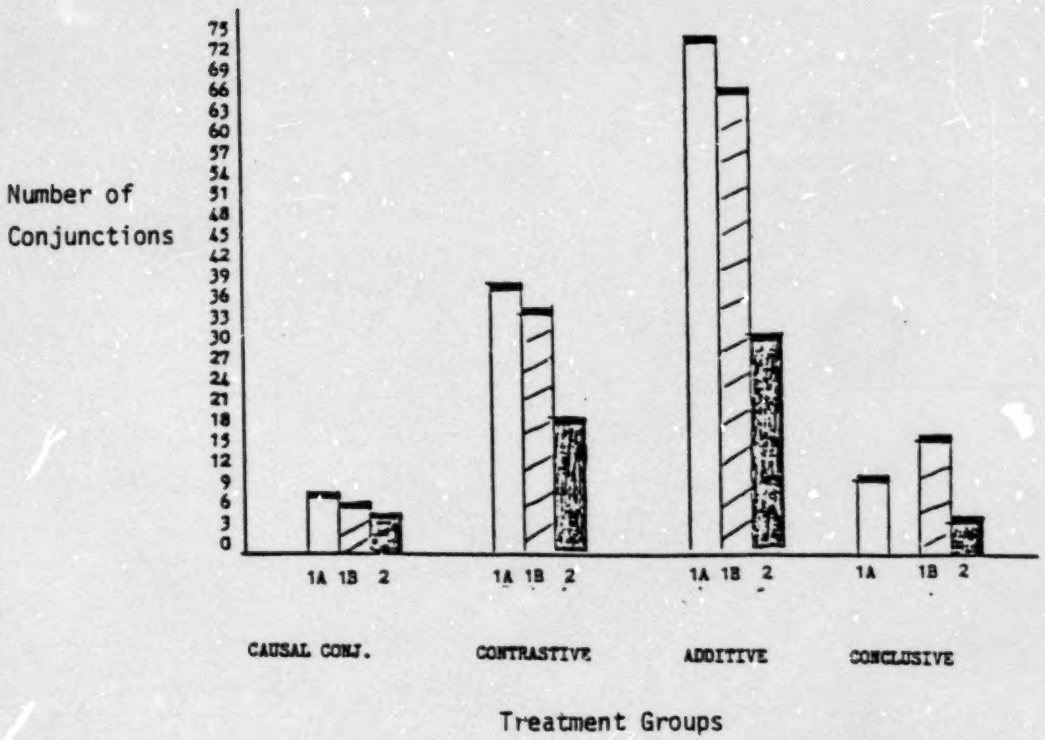

Fig. 5. Total number of conjunctions in each category for each of the treatment groups. Scores based on a trait analysis performed on the essays written for the Organizational Patterns Test.

analysis of variance on gain scores for cohesive ties, Table 2, indicates that the difference in use of cohesive ties was statistically significant when comparing gain scores between the pre and posttests.

The third hypothesis stated that Ss who developed maps for their essays would write longer essays than Ss who did not develop maps. Ss in groups 1A and 1B wrote longer essays than Ss in group 2 who did not map for their essays. Figure 6 shows that Ss in treatment group 1A wrote essays averaging 197 words in length, group 1B essays averaged 201 words and group 2 essays averaged 185 words. Thus, Ss who mapped wrote essays which were 7% longer than nonmapping Ss. And, as previously discussed, mapping Ss also wrote essays with significantly more cohesion than did nonmapping Ss.

The fourth hypothesis predicted that Ss in groups 1A and 1B who developed maps based on their reading would identify main ideas and supporting details significantly more often than Ss in group 2. The essays of Ss in treatment groups 1A and 1B were compared with group 2 Ss who did not develop cognitive maps. Based upon the data in the trait analysis, no difference was found in the students' abilities to recognize the main ideas in articles. Ss in the mapping groups, however, did use more supporting details than the nonmapping Ss. As shown in Figure 5, mapping Ss used more conjunctions than nonmapping Ss. These conjunctions not only represent cohesive points in the essays, but also represent shifts in propositions relating to the articles the students read. Thus, Ss in the mapping groups related more propositions or supporting details than the nonmapping students.

Table 2

Analysis of variance on gain scores
for cohesive ties across all treatment groups and
for the three sections of the Organizational Patterns Test

COHESIVE TIES

	Sum of Squares	DF	Mean Square	F-Value
Between Groups	$SS_b = 23$	2	$MS_b = 11.5$	
Within Groups	$SS_w = 48$	46	$MS_w = 1.04$	11.05
Total	$SS_t = 71$	48		

*Significant at .001 level

BEST COPY AVAILABLE

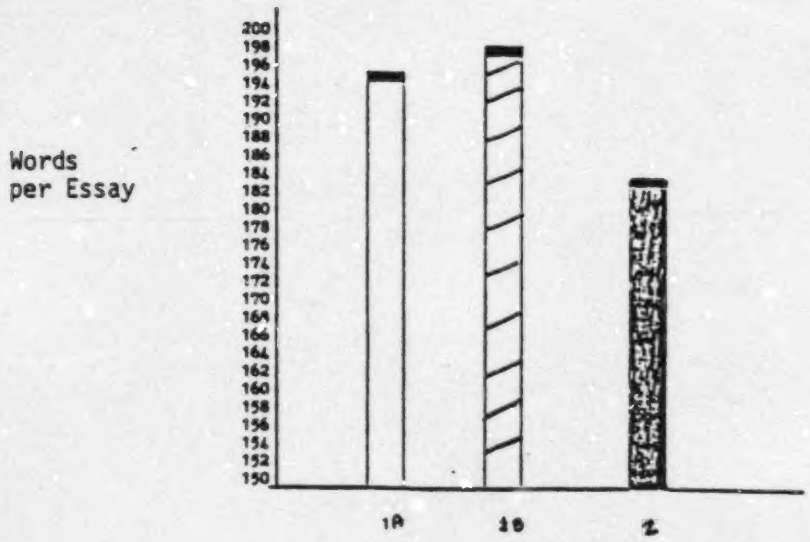

Fig. 6. Mean number of words for each of the three essays on the Organizational Patterns Test for each of the three treatment groups.

The maps apparently assisted students in graphically listing details and in writing about and remembering the details in the articles on the OPT.

The fifth hypothesis stated that different organizational prose patterns would affect all Ss' abilities to analyze and synthesize information and to report what they had learned in written protocols. The following order of difficulty was predicted:

informational<thesis-proof<problem-solution

The pretest results of the OPT written protocols appear to support this order of difficulty; the OPT results after intervention, however, present quite different results.

Informational Pattern. Ss in each treatment group received their highest holistic score on the pretest informational pattern, but the overall posttest scores on the informational pattern were the lowest. It would appear that students received their highest score on the pretest on the informational pattern because it was the easiest for them to read and because the information was presented in a serial/list-like fashion, i.e., topic sentence followed by several supporting details. It was also easier for them to organize a written protocol. The information patterns consisted of basic ideas, i.e., causes of headaches, followed by information presented in serial fashion, i.e., first cause, second cause, third cause. This informational structure elicited a similar list-like structure on written protocols. Students in all three treatment groups typically gave the main ideas of these articles and then gave the various

details in identical order as presented in the original articles. The informational structure asked for no special reordering or reconstructing of information; as a result, students found it easiest to write about in the pretest. The lack of growth in the posttest may be due to a ceiling affect resulting from the simple structure of the informational article which elicited essays with less sophisticated structure.

Thesis-proof and Problem-solution Patterns. The thesis-proof and problem-solution patterns elicited different patterns of responses from Ss than did the informational pattern. Ss could not as easily develop essays from these patterns in a serial-like manner. Ss were required to reconstruct information in these two patterns by first analyzing and then synthesizing the information presented in the articles. Rather than just writing about the first, second, and third aspect presented in an informational aticle, Ss had to consciously orchestrate the information in the thesis-proof and problem-solution patterns because the information was not presented in a list-like manner, e.g., thesis-proof: Thesis-background-proof-implication; and, problem-solution: problem-effects-cause-solution.

Ss in treatment groups 1A and 1B made greater holistic gains on the thesis-proof and problem-solution patterns than did Ss in group 2. The latter Ss who did not map articles progressed relatively the same on all three patterns. Mapping the articles helped students reconstruct the information in the articles and helped them present the information more effectively. The mapping Ss in treatments 1A and

18 received an average holistic score on these two patterns of 8.3 points while nonmapping students averaged 7.2.

Mapping students gained an average of two points in holistic scores while nonmapping students advanced only .6 point. It is interesting to note that nonmapping Ss showed the same rate of growth from pre to posttests on all three patterns whereas mapping Ss showed a greater rate of growth on the more difficult patterns. This information suggests that mapping is particularly helpful when students are reading difficult material.

Summary and Conclusions

The purpose of this study was to identify the effects of cognitive mapping on written protocols derived from three different text patterns. The following conclusions are based on the findings of the study.

First, Ss who mapped articles they read and used these maps to develop written protocols scored significantly higher on holistic scores for two of the 3 patterns than students who did not develop cognitive maps for their writing. In addition, Ss who mapped showed significant growth when pre and posttest holistic scores were compared.

Second, Ss who developed maps for written protocols wrote essays containing more cohesive ties than did Ss who did not map for their essays. It is hypothesized that the maps assisted Ss in organizing and synthesizing the ideas presented in the OPT articles and enabled them to concentrate on the interrelationships between and among ideas in their essays.

Third, Ss who mapped the OPT articles wrote longer essays with more supporting details from the OPT articles than Ss who did not develop maps. It is hypothesized that the maps reduced memory demand, allowing them to generate and integrate more ideas and details from the articles.

Fourth, students in all treatment groups identified main ideas in articles with equal success resulting in no significant differences. However, mapping did assist students in generating more details in their essays.

Fifth, organizational patterns had an effect on written protocols for all Ss, but this effect appears to be neutralized when students use maps to organize essays based upon articles they have read. On the pretest OPT holistic scores, students scored highest on the informational pattern as predicted and lowest on the problem-solution pattern. After mapping, however, mapping treatment Ss in 1A and 1B scored higher on the problem-solution than on the informational pattern. Treatment group 2 scored highest on the informational and lowest on the problem-solution patterns in both the pre and posttests. Thus, it was concluded that mapping assisted students in the more difficult tasks of orchestrating the information and ideas in the thesis-proof and problems-solution patterns.

Footnote

1. The only difference between group 1A and 1B was that students in group 1B came from different courses across the campus rather than from Sociology 1.

References

Bartlett, B. J. (1978). Top-level structure as an organizational structure for recall of classroom test. Unpublished doctoral dissertation, University of Arizona.

Boyle, O. F. (September 1983). Mapping: A prewriting technique that works. Notes Plus: A quarterly of practical teaching ideas. Urbana, Illinois: National Council of Teachers of English.

Brown, A. L. (1982). Learning how to learn from reading. In J. A. Langer, & M. T. Smith-Burke (Eds.), Reader meets author/ bridging the gap. Newark, Deleware: IRA.

Brown, A. L., Campione, J. C., & Day J. (1981). Learning to learn: on training students to learn from texts. Educational Researcher, 10(2), 14-21.

Halliday, M. A. K., & Hasan, R. (1976). Cohesion in English. London: Longman.

Hanf, M. B. (1971). A technique for translating reading into thinking. Journal of Reading, 14, 225-230.

Hanf-Buckley, M. B., & Boyle O. F. (1981). Mapping the writing journey. Bay Area Writing Project. University of California, Berkeley.

Jaggar, A. M., & Rothenburg-Struhl, P. (1978). Feminist frame-works: Alternative theoretical accounts of the relations between women and men. New York: McGraw-Hill Book Company.

Kintsch, W. (1972). Notes on the structure of semantic memory. In E. Tulving, & W. Donaldson (Eds.), Organization of memory. New York: Academic Press.

Kintsch, W., & Van Dijk, T. A. (1978). Toward a model of text comprehension and production. Psychological Review, 85, 363-394.

Meyer, B. (1975). The organization of prose and its effect on memory. Amsterdam: North Holland Press.

Ruddell, R. B., & Boyle, O. F. (1983). Predictors of academic success and learning from text strategies of UC Berkeley Freshmen. In H. Singer, & T. Bean (Eds.), Final report: Learning from text project, 1981-1982: Conceptualization, prediction, and intervention. University of California, Riverside.

Rumelhart, D. E., & Ortony, A. (1977). The representation of knowledge in memory. In R. C. Anderson, R. J. Spiro, & W. E. Montague (Eds.), Schooling and the acquisition of knowledge. Hillsdale, New Jersey: Erlbaum.

Sack, A., & Yourman, J. (1973). The Sack-Yourman Developmental Speed Reading Course. New York: College Skills Center.

Tierney, R. (1982). Discourse comprehension and production: analyzing text structure and cohesion. In J. A. Langer, & M. T. Smith-Burke (Eds.), Reader meets author/bridging the gap. Newark, Deleware: IRA.